MASSACHUSETTS
BAY
TRANSPORTATION
AUTHORITY

TECHNICAL SPECIFICATION

EE&QA-961

Repair Specification for MBTA Green Line No. 8 Vehicle 3894

ISSUED: September 15, 2023

REVISION: 1

EQUIPMENT ENGINEERING AND QUALITY ASSURANCE

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REVISION HISTORY

Revision Number	Revision Date	Revised Sections	Description, Reason for changes
1	9/15/2023		

1.0 PURPOSE:

This Technical Specification details the requirements of the Massachusetts Bay Transportation Authority (MBTA), herein known as the Authority, for repair of its Green Line Type 8 Light Rail Vehicles carbody.

2.0 DESCRIPTION OF THE DAMAGED VEHICLES:

2.1 The Green Line Type 8 Light Rail Vehicle were manufactured by Ansaldo Breda between the years of 1998 to 2009 for use on the MBTA's Green Line.

2.2 The vehicles are split into has three sections, designated as the A-End, B-End and C (Center) Sections. The A and B-end are equipped with Traction Motor powered trucks, while the Trailer Truck is located under the Center section and is non-powered. Most of the equipment is located on the roof of the vehicle. Further information can be found within the relevant maintenance manuals provide in Appendix C.

2.3 On July 30, 2021, Vehicle 3894 was involved in an accident with a Type 7 vehicle in revenue service. 3894 sustained damage on both A and B-ends from a low-speed collision. The A-end of vehicle 3894 was the leading end and point of contact for the collision.

2.4 Initial assessment of the vehicle revealed that it sustained damage to the couplers, anticlimbers, exterior sidewall, fiber glass panels, headlight panels, marker light panels, roof area, windshield wiper unit, End door frame, End lower door sills, underframe sound deadening panels, and articulation sections. A full damage report can be found in Appendix F.

2.5 Section 4.0 describes the intended Technical Scope of Work for the vehicle.

3.0 SCOPE OF SERVICES:

3.1 General

3.1.1 The scope of this project is to ensure that Vehicle 3894 is repaired as required to restore complete functionality and provide performance and reliability consistent with the vehicle performance and reliability prior to the accident. The work shall consist of disassembly, cleaning, dimensional and NDT inspection, component replacement and/or repair, painting, and testing. The work shall comply with all applicable industry standards, codes, regulations, federal and state laws, OEM requirements, Authority modifications and maintenance, and the requirements of this Specification.

3.1.2 The MBTA understands that, over the course of the repairs and inspections, the vehicle may have damage and require repairs beyond the scope of work provided in this Specification. These repairs will be identified as Hidden Damage. Requirements for Hidden Damage repairs are provided in Section 3.3.

3.1.2.1 Any repairs or replacement beyond the scope of this Specification must be authorized by the Authority prior to beginning work.

3.1.3 The Contractor shall work closely with the Authority to develop all repair processes and technical documentation.

3.1.4 The Contractor shall furnish all engineering, testing, management, labor, materials, tools, incidentals, and all other items required to complete the specified work.

3.1.5 The Contractor shall be responsible for all logistics and costs associated with transportation between MBTA shops, the Contractor's facility, and any Subcontractors' facilities.

3.1.6 The Contractor shall be responsible for developing, procuring, maintaining, and calibrating all tools and test equipment necessary to ensure that the requirements of this Specification are met.

3.1.6.1 Calibration requirements for measurement tools and test equipment are provided in Section 6.4.

3.1.6.2 The Contractor shall not permit the destruction of any special

tool or test equipment, such as drill jigs, welding fixtures, assembly fixtures, or test racks, without first offering the Authority the opportunity to acquire the same at no additional cost.

3.1.7 The Contractor shall perform all repair work, inspections, and tests using written work instructions submitted to and approved by the Authority in accordance with Section 7.2.

3.1.7.1 Work instructions must identify all tooling and test equipment used in the performance of the work.

3.1.7.2 At a minimum, all tests and inspections required by the OEM documentation and this Specification must be performed. The Contractor shall be responsible for performing these tests and inspections as necessary to ensure proper interfaces and functionality of the vehicle.

3.1.8 Records must be kept of all inspection and testing results. The Contractor shall include all in-process inspections and tests, as well as the receiving inspection, and pre-shipment inspection, defined in Section 6.10.

3.1.8.1 The Contractor shall include all inspection and testing records in the Vehicle History Book provided by the Contractor per Section 7.7.

3.1.9 The Contractor shall record all nonconforming materials identified on a Nonconforming Materials Report (NCR) per Section 6.12.

3.1.9.1 The Contractor shall include all NCRs in the Vehicle History Book provided by the Contractor per Section 7.7.

3.1.10 The manufacturer, model, revision level, and serial number of all serialized equipment that is removed or installed during the repair process must be recorded and included in the Vehicle History Book as required by Section 7.7.

3.1.11 The Contractor's quality control system shall adhere to the approved Project Quality Assurance Plan defined in Section 6.1.

3.1.11.1 The Contractor's quality control system shall ensure that all

necessary operations are performed, properly documented, and verified by qualified quality control personnel at the time that the work is completed.

3.1.12 The Contractor shall return to the Authority the vehicle fully assembled and ready to run.

3.1.13 Work performed on, and material applied to, the repaired vehicle must be in compliance with the following documents, listed in order of precedence. All materials used for this Contract shall meet the flammability, smoke emission, and toxicity requirements provided in these documents.

3.1.13.1 Federal, State (Massachusetts), and Local codes and regulations.

3.1.13.2 The requirements of this Technical Specification.

3.1.13.3 OEM drawings, illustrated parts catalogs, and maintenance/overhaul manuals, Appendix C.

3.1.13.4 Common Work Requirements, Appendix A

3.1.13.5 MBTA No. 8 Low Floor Car Technical Specifications, Conformed through CO12, Dated 12/2/2008, provided in Appendix D.

3.1.13.6 MBTA Specification EE&QA #770 Materials and Workmanship, provided in Appendix B.

3.1.13.7 Applicable industry standards and recommended practices proposed by the Contractor and approved by the Authority.

3.2 Repair Requirements

3.2.1 The repair shall include complete disassembly of the damaged components into their component parts and/or subassemblies. The repair shall include cleaning, inspection, repair, replacement, painting, lubrication, calibration, adjustment, testing, reassembly, and all other work required to produce a complete and functional vehicle meeting the requirements of this Specification.

3.2.2 Table 1: Scope of Work summarizes the repair scope for each truck system and component. The following definitions are used in Table 1: Scope of

Work and throughout this Specification.

3.2.2.1 Design/Fabricate: Shall mean design, analysis, fabrication, installation, and testing of a new component/assembly. Authority approval is required for all design documentation, analysis and test procedures and reports, and installation procedures prior to commencing with the applicable task.

3.2.2.2 Inspect: Shall mean cleaning, inspection, painting, and related processes, such as measurements and tests, as defined in the Specification. If required, repairs or replacements are considered Hidden Damage and shall be performed in accordance with an approved Corrective Action Plan (CAP), reference Section 6.12.

3.2.2.3 Install: Shall mean affixing or mounting the component or assembly to the vehicle according to OEM specification. The component or assembly shall be Authority-provided, fabricated or repaired.

3.2.2.4 Repair: Shall mean fixing specific damage following procedures and acceptance criteria approved by the Authority and outlines by this Specification. Repaired components/assemblies shall be within tolerances for new equipment, unless otherwise approved by the Authority. Items determined to be beyond repair shall be considered Hidden Damage and shall be replaced.

3.2.2.5 Replace: Shall mean installation of a new OEM component/assembly or a new component/assembly meeting the OEM requirements, as specified, on all trucks and bolsters.

3.2.2.6 Replace As Needed: Shall mean installation of a new OEM component/assembly or a new component/assembly meeting the OEM requirements, as specified, when the existing component/assembly is found by the Contractor to be nonconforming based on the specified Authority Approved inspections and/or tests.

3.2.2.7 Test: Shall mean verification of the OEM functionality of a component/assembly by following evaluative procedures, as defined in the Specification.

3.3 Non-Documented Damage (Hidden Damage)

3.3.1 Any repairs required that are not otherwise covered within the scope of this Specification shall be considered Hidden Damage. The Contractor shall submit an NCR and CAP for each necessary Hidden Damage repair in accordance with Section 6.12.

3.3.1.1 The Contractor shall only proceed with corrective action upon receipt of written approval from the Authority.

3.3.1.2 Work scope may be authorized in phases as disassembly proceeds and determinations of vehicle condition is made.

4.0 TECHNICAL SCOPE OF WORK

4.1 GENERAL REQUIREMENTS:

4.1.1 Contractor Responsibilities

4.1.1.1 The Contractor shall replace all hardware, electrical cables, wiring/harnesses, hoses, or elastomeric components that are removed as part of the vehicle repair with new components meeting the OEM requirements, except as otherwise required by this Specification.

4.1.1.2 The Contractor shall clean and protect all component identification labels or decals from damage during repair. An identification labels or decals that are damaged shall be replaced in kind.

4.1.1.3 The Contractor shall properly mark all wiring and hoses disconnected in the process of the repair in accordance with the OEM schematic diagram, as approved by the Authority.

4.1.1.4 The Contractor shall be responsible for developing technical requirements for Authority review and approval where technical information, such as dimensions, tolerances, material, manufacturing/assembly process, heat treatment, finishing, corrosion protection, and inspection, are missing from the OEM drawings.

4.1.1.4.1 The Contractor may need to develop other technical

information; the list above is not exhaustive.

4.1.1.4.2 The Authority does not certify or guarantee the accuracy of the OEM drawings or other documentation. The Contractor is responsible for confirming that the information provided in OEM drawings and documents is correct and reasonable for this application. The Contractor shall apply to the Authority in writing with any questions or concerns about the accuracy of information in the OEM drawings or documents and shall adhere to the Authority's written response.

4.1.1.4.3 The Authority is aware of errors in the conversion between metric and imperial units in the OEM drawings and documentation. The Contractor shall use the values provided in metric units unless the Contractor or Authority determine otherwise.

Table 1: Scope of Work

System	Item	Component	Drawing Reference	DWG Provided	Authority Component Provided	Scope
A End Coupler	1	Coupler	R12_000020_T001	Yes	Yes	Install
B End Coupler	1	Coupler	R12_000020_T001	Yes	Yes	Install
	2	Coupler Mount	R12_310200_T001 R12_310200_T002	Yes	Yes	Repair
A and B Truck	3	Truck Assembly	J35_200000_T001_R02	Yes	Yes	Replace
C Truck	4	Truck Assembly	J36_200000_T001_R01	Yes	Yes	Replace
Cab	5	A Cab Heater	R12_611900_T001_R03	Yes	No	Inspect
Windshield Wiper	6	A End Full Wiper Assembly Set	R12_496700_T001_R08 R12_496700_T002	Yes	No	Replace and Test
	6.A	A End Wiper Mount	R12_496700_T001_R08 R12_496700_T002	Yes	No	Inspect
Doors	7.A	A1 Door Frame Structure	R12_300001_T001 R12_300001_T002	Yes	No	Inspect/Repair

System	Item	Component	Drawing Reference	DWG Provided	Authority Component Provided	Scope
	7.B	A1 Door	R12_354100_T001 R12_354000_T001_R04 R12_354000_T002_R02	Yes	No	Adjust and Test
Car Body	8.A	A End Anticlimber	R12_310660_T001 R12_310100_T001 R12_310100_T002 R12_310100_T003	Yes	Yes, As Needed	Repair or Replace
	8.B	A End Anticlimber Mount	R12_310665_T001	Yes	No	Inspect
	8.C	A End Skirt	N/A	Yes	Yes	Replace
	8.D	A End Skirt Mounting	N/A	Yes	No	Inspect, Repair as needed
	8.E	A End Headlight Panel	R12_314401_T001 R12_314401_T002	Yes	Yes	Replace
	8.F	A End Insulating Panel	R12_000700_T001	Yes	Yes	Replace
	8.G	A End Wiper Assembly	R12_496700_T001_R08 R12_496700_T002	Yes	Yes	Replace
	8.H	A End Wiper Mount	12_496700_T001_R08 R12_496700_T002	Yes	No	Replace
	8.I	B End Anticlimber	R12_310660_T001 R12_310100_T001 R12_310100_T002 R12_310100_T003	Yes	Yes, As Needed	Repair or Replace
	8.J	B End Anticlimber Mount	R12_310665_T001	Yes	No	Inspect
	8.K	C Car Upper Linkage Mounts	R12_375617_T001	Yes	No	Replace the hardware and Torque/ torque

System	Item	Component	Drawing Reference	DWG Provided	Authority Component Provided	Scope
						stripes
	8.L	Car Piping	R12_586365_T001_R05	Yes	No	Damaged/ Test for leakage, repair as needed
	8.M	C Panel Mounting	R12_961082_T001_R03	Yes	Yes	Damaged/ Replace brackets, reinstall panels
	8.N	C Car Airline Bracket	N/A	No	No	Damaged/Repair

4.2 A and B End Couplers and Draft Sill

4.2.1 The contractor shall perform an NDT inspection of the B End Draft Sill surface and repair the coupler mount surface per OEM specification.

4.2.1.1 The contractor shall ensure that the surface allows for a flush surface mount of the B End coupler.

4.2.2 The Contractor shall install the Authority provided A and B End couplers per OEM specifications.

4.2.2.1 The Contractor shall ensure the coupler mounting bolts are torqued according to OEM specifications.

4.2.2.2 The Contractor shall be functionally, and leak test the couplers upon installation per OEM specifications.

4.3 Trucks and Truck/Carbody Connections

4.3.1 The Contractor shall remove and disconnect all vehicle trucks pneumatically, electrically, and physically.

4.3.1.1 All vehicle electrical, pneumatic and physical truck connections shall be capped off or protected to prevent debris, damage or contamination as needed.

4.3.1.2 The truck mounting points shall be inspected per OEM specification.

4.3.2 The trucks shall be removed from the vehicle and sent out to be overhauled by ORX Railway Corporation per TS EEQA-884.

4.3.3 ORX shall provide 2 MT and 1 TT to the Contractor for installation onto the vehicle per OEM specifications. The Authority shall perform a pre-shipment inspection at ORX of the provided trucks.

4.3.4 The provided trucks shall be installed onto the vehicle per OEM specification.

4.3.4.1 The trucks shall be leak tested per OEM specification.

4.4 Cab Heater

4.4.1 The Contractor shall inspect the cab heater electrical system for damage.

4.4.1.1 All damages found as a part of this inspection shall be considered Hidden Damages

4.4.2 If any damages are found, the Contractor shall repair the components to restore OEM functionality to the cab heater.

4.5 A End Wiper Assembly

4.5.1 The Contractor shall replace the A End Wiper Assembly per OEM specification.

4.5.1.1 Upon removal of the A End Wiper Assembly for replacement, the contractor shall inspect and repair the damaged the wiper mounting to include underlying frame members and equipment for additional damages. All damages found as a part of this inspection shall be documented within the Vehicle History Book and considered Hidden Damages.

4.5.1.2 The Wiper Mounting shall be repaired, and the new wiper assembly shall be installed and adjusted per OEM specifications.

4.5.1.3 The Wiper assembly shall be functionally tested per OEM specifications.

4.6 A1 Doors

4.6.1 The Contractor shall remove the A1 Door Panels, repair the A1 door frame and reinstall the panels per OEM specifications.

4.6.1.1 Upon removal of the A1 Door, the contractor shall repair the damage of the A1 door frame and inspect the underlying frame members and equipment for additional damages. All frame member damages found as a part of this inspection shall be documented within the Vehicle History Book and considered Hidden Damages.

4.6.1.2 The A1 Doors shall be functionally tested per OEM specifications after reinstallation.

4.7 A End Skirt and Mounting

4.7.1 The Contractor shall inspect of the A End Skirt mounts for damage.

4.7.1.1 All damages found as a part of this inspection shall be documented within the Vehicle History Book and considered Hidden Damages.

4.7.1.2 The Contractor shall install the missing A End Skirt with an Authority provided component.

4.8 A End Headlight Panel

4.8.1 The Contractor shall replace the A End Headlight Panel per OEM specification.

4.8.1.1 Upon removal of the A End Headlight Panel for replacement, the contractor shall inspect and repair the damaged mounting brackets and inspect the underlying frame members and equipment for additional damages. All damages found as a part of this inspection shall be documented within the Vehicle History Book and considered Hidden Damages.

4.9 A End Undercar Insulating Panel

4.9.1 The Contractor shall replace the A End Undercar insulating Panel per OEM specifications.

4.9.1.1 Upon removal of the damaged A End Insulating Panel for replacement, the contractor shall inspect and repair any damage to mounting surfaces and inspect the underlying frame members, wiring and equipment for additional damages. All damages found as a part of this inspection shall be documented within the Vehicle History Book and considered Hidden Damages.

4.10 Anti Climbers

4.10.1 The Contractor shall remove and repair as needed the A and B End Anticlimbers.

4.10.1.1 Upon removal of the Anticlimber, the contractor shall perform local cleaning/paint removal, MT and NDT of critical end underframe areas, inspect the installation and mounting locations and underlying frame members and equipment for additional damages. All damages found as a part of this inspection shall be documented within the Vehicle History Book and considered Hidden Damages.

4.10.1.2 In the event the Anticlimber is found to be too damaged to be repaired, the Contractor shall inform the Authority and request a replacement.

4.10.1.3 A repaired Anticlimber assembly shall be inspected for quality of workmanship. All hardware shall be properly torqued and torque striped.

4.11 C Car Upper Linkage Mounts

4.11.1 The Contractor shall replace the hardware for the C Car Upper Linkage Mounts between both the A and B ends of the vehicle. These shall be replaced and torqued

shall be replaced per GL-01-01MP-8.

4.11.2 The Contractor shall ensure the bolts are torqued striped per OEM specifications.

4.12 C Car Piping Replacement

4.12.1 The Contractor shall repair the C truck airline bracket per OEM specification.

4.12.2 The Contractor shall inspect the C Car piping and perform a leak test to determine if any air piping must be replaced. All damages found as a part of this inspection shall be documented within the Vehicle History Book and considered Hidden Damages.

4.12.2.1 Any damaged piping shall be replaced and open piping and fittings shall be plugged whenever possible to prevent moisture or debris from entering the pneumatic system.

4.12.2.2 Damaged Piping and Brackets that have been repaired or replaced shall be tested per OEM Specifications.

4.12.2.3 All fasteners shall be properly Torqued and Torque marked.

4.12.2.4 All test results shall be submitted as a part of the vehicle history book.

4.13 C Car Panel

4.13.1 The Contractor shall inspect the C Car Panel for damage and repair as needed.

4.13.1.1 Upon disconnecting and removal of the Dropped Panel, the contractor shall inspect the panel, mountings brackets and underlying frame and attachment point for damage. All damages found as a part of this inspection shall be documented within the Vehicle History Book and considered Hidden Damages.

4.13.1.2 Reinstall old panel if no damage is found and adjust fit to OEM standards.

5.0 COMMON WORK REQUIREMENTS:

5.1 The Contractor shall review the attached Appendix A and provide any of the required CDRL documents as needed. These CDRL documents include the following:

5.1.1 Visual Inspection Procedure

5.1.2 Magnetic Particle Inspection Procedure

5.1.3 Dye Penetrant Inspection Procedure

5.1.4 Ultrasonic Inspection Procedure

5.1.5 Weld Repair Procedure of Cracks in Fabricated Structures

5.1.6 Weld Repair Procedure of Defects in Castings

5.1.7 Weld Repair Procedure of Mounting Surfaces

5.1.8 Weld Repair Procedure of Clearance Holes

5.1.9 Repair Procedure of Threaded Holes

5.1.10 Weld Repair Procedure of Threaded Holes

5.1.11 Weld Repair Procedure of Secondary Brackets

5.1.12 WPS, PQR, and Welding Consumable Specifications

5.1.13 Straightening Procedure

5.1.14 Local Heat Treatment Procedure

5.1.15 Furnace Heat Treatment Procedure

5.1.16 Corrosion Protection Plan

5.1.17 Grit Blasting Procedure

5.1.18 Cleaning and Stripping Plan

5.1.19 Ground Pad Inspection, Cleaning, and Repair Procedure

5.1.20 Hydraulic System Leak Test Procedure

5.1.21 Pneumatic System Leak Test Procedure

5.1.22 Hydrostatic Test Procedure

5.1.23 Electrical Testing Procedure

6.0 QUALITY AND CONFIGURATION REQUIREMENTS

6.1 Project Quality Assurance Plan (PQAP)

6.1.1 To provide a quality product to the Authority, the Contractor shall have planned and established a documented quality assurance program in compliance with ANSI/ISO/ASQ Q9001-2008 or latest revision, and FTA Quality Management System Guidelines, FTA-PA-27-5194-12-1.

6.1.2 The Contractor shall apply the principles of the appropriate ISO 9000 series processes or equivalent and enforce the elements of the quality assurance program within all parts of its organization and with all manufacturers, subcontractors, and suppliers performing Contract work.

6.1.3 Quality system documentation must be consistent with the skills needed, methods used, and training resident among personnel performing Contract work in accordance with the requirements of this specification.

6.1.4 The Contractor shall submit for Authority review and approval its proposed Project Quality Assurance Plan (PQAP). [CDRL 6.1.4]

6.1.4.1 This Plan must identify the controls, resources, and skills the Contractor will apply to satisfy project quality system requirements.

6.1.4.2 For each specified quality system requirement, the Plan must identify how it will be satisfied, when, where, and by which job function.

6.1.4.3 It must include a flow chart of the manufacturing and repair sequence with all planned inspections, hold points, and customer witness points indicated. The chart shall indicate entities participating in the inspections.

6.1.4.4 Required inspection equipment, measurements, personnel certifications, workmanship acceptance standards, methods of inspection, and quality record documentation shall be identified in the PQAP.

6.1.4.5 The PQAP may refer to specific sections of other Contractor documents, such as the Quality Manual and supporting procedures, if such documents are applicable to this project.

6.1.5 The Authority shall be notified of all customer witness point inspections and provided with an opportunity to witness these inspections. However, work may proceed beyond said inspection without written authorization from the Authority. The Authority reserves the right to institute at any time additional customer witness point inspections.

6.1.6 The Authority reserves the right to institute at any time customer-witnessed hold-point inspections. If customer-witnessed hold-point inspections are instituted, the Contractor may not proceed beyond said inspection prior to receiving written authorization from the Authority.

6.1.7 The Authority reserves the right to perform random in-process inspections.

6.2 Process Control

6.2.1 A significant part of the Contractor's quality and repair program shall be to prevent problems by controlling the applicable repair processes, thereby lessening the demands on required inspection and correction activities. To this end, the Contractor shall identify and plan processes necessary to produce, under controlled conditions, products, and services of the specified quality.

6.2.2 The Contractor shall prepare documented instructions and workmanship criteria and monitor and approve production processes.

6.2.3 Production equipment and processes must be maintained as necessary to ensure that products satisfy specified requirements.

6.3 Material Procurement and Control Plan

6.3.1 The Contractor and all Subcontractors shall establish and utilize procedures for control of components/assemblies provided by the Authority, fabricated by the Contractor or Subcontractor, or procured by the Contractor or Subcontractor.

6.3.2 The Contractor and all Subtractors shall submit for Authority review and approval a Material Procurement and Control Plan defining procedures and processes that will be utilized by the Contractor and all Subcontractors for material procurement and control. [CDRL 6.3.2] At a minimum, the plan must identify procedures and processes for the following:

6.3.2.1 Configuration Control, to prevent purchase or use of incorrect or obsolete components/assemblies.

6.3.2.2 Material Availability, including base stock quantity, lead time, and re-order quantity for each component/assembly.

6.3.2.3 Receiving Tests or Inspections, to prevent use of defective material purchased or fabricated by the Contractor or Subcontractor. Acceptance criteria shall be identified for all tests or inspections.

6.3.2.3.1 Requirements must be provided for additional testing if nonconforming materials are identified.

6.3.2.4 Material Identification and Accountability, through all stages of the repair process. Individual components/assemblies or lots shall retain unique identification and indicate their acceptance, rejection, or uninspected status.

6.3.2.5 Control and Disposition of Nonconforming Materials, to prevent inadvertent use or installation of defective components/assemblies.

6.3.3 Suppliers of nonconforming material shall be notified of the nonconformance and the Contractor shall work with the Supplier or identify a new Supplier to prevent recurrence of the defect.

6.3.4 The Contractor shall establish a Material Review Board (MRB), comprised of qualified individuals, to review and dispose of nonconforming materials, recommend corrective actions to prevent recurrence of the defect, and verify that corrective actions have been implemented.

6.4 Control and Calibration of Measurement Tools and Test Equipment

6.4.1 Measurement tools and test equipment must be kept in current calibration over the length of the Contract. The Contractor and any Subcontractors shall establish and utilize control and calibration procedures to ensure that only calibrated measurement tools and test equipment are used.

6.4.1.1 The method and period of recalibration must be in accordance with a recognized national standard.

6.4.1.2 The Contractor and any Subcontractors shall keep on file a certification of calibration for all measurement tools and test equipment.

6.4.1.3 Calibration status, including calibration due date, must be marked on all measurement tools and test equipment.

6.4.1.4 Inspection and test records must include the identification and calibration status of all measurement tools and test equipment used.

6.4.1.5 Measurement tools and test equipment must be suitably stored to ensure

continued accuracy and fitness for use.

6.4.2 Control and calibration procedures must contain provisions for determining the validity of previous measurements and tests and taking appropriate corrective action if measurement tools or test equipment are found out of calibration.

6.5 Inspection and Test Status

6.5.1 The Contractor shall identify by suitable means the inspection and test status of products throughout the work process so that only acceptable parts are used. The Contractor's Project Quality Assurance Plan must identify the inspection authority responsible for releasing parts as conforming at each stage of the work.

6.6 Controlling Nonconforming Products and Services

6.6.1 The Contractor shall establish and maintain a procedure to prevent the inadvertent use of nonconforming materials. Nonconforming materials must be segregated from acceptable items. In any case, the Contractor remains solely responsible to prevent unauthorized use of nonconforming material.

6.7 Corrective and Preventive Action

6.7.1 The difference between *corrective* and *preventive* action must be clearly expressed in the Contractor's Project Quality Assurance Plan.

6.7.1.1 Corrective Action procedures must address actual nonconformities that have occurred.

6.7.1.2 Preventive Action procedures must address the potential for nonconformity to occur in the future.

6.7.1.3 The Contractor shall establish and maintain procedures for taking corrective and preventive action that is appropriate to the size of the problems and commensurate with the risks that they present.

6.7.2 Corrective Action procedures must be effective in handling complaints from nonconformance reports and from all entities, including the MBTA. Methods must include problem analysis, recording results, determining the most effective corrective action, verifying that corrective actions have been taken, and that they are effective.

6.7.3 Preventive Action procedures must require use of all available information to eliminate potential sources of nonconformity. Methods must include data and information analysis, determining the best approaches to preventing nonconformity, implementing and ensuring effectiveness of preventive action

plans, and forwarding significant details of actions taken for review by management.

6.8 Use of Statistical Techniques

6.8.1 Statistical quality control applications used in acceptance of parts, materials, or processes by the Contractor or its suppliers must be fully documented and based on generally recognized and accepted statistical quality control methods and defined in the Contractors Project Quality Assurance Plan.

6.9 Documentation

6.9.1 All reports, plans, programs, procedures, schedules, and other materials prepared for the Contract work to be performed by the Contractor or any Subcontractors must be the property of the Authority. The Authority shall be entitled to copies and access to these materials during the progress of the Contract. All such reports, plans, programs, procedures, schedules, and other materials must be readily accessible to the Authority.

6.10 Inspection and Test Plan

6.10.1 Inspection and testing are used as a means for the Contractor to demonstrate Specification compliance to the Authority. The Contractor shall submit an Inspection and Test Plan for review and approval by the Authority. [CDRL 6.10.1]

6.10.1.1 The Inspection and Test Plan must include a comprehensive list of all inspection and testing to be performed before, during, and after truck vehicle repairs, including references to the written inspection and test procedures.

6.10.1.2 The arrangement and content of Inspection and Test Procedures must be approved by the Authority as part of the Inspection and Test Plan.

6.10.2 The Contractor shall establish and maintain written procedures for inspection and testing activities, including requirements for feature, function, and performance verification/validation. All Inspection and Test procedures must be submitted to the Authority for review and approval. [CDRL 6.10.2]

6.10.2.1 Procedures must identify all measurement tools and test equipment required to perform the inspection or test.

6.10.2.2 Acceptance criteria must be identified for all inspections and tests.

6.10.3 Records must be kept of all inspection and testing results before, during, and after repairs to provide objective evidence that specified product requirements have been

met. This includes all in-process inspections and tests, as well as the receiving inspection, pre-shipment inspection, and first article inspection. The arrangement and content of the record forms must be approved by the Authority as part of the Inspection and Test Plan.

6.10.3.1 Records must include actual results of measurements taken and tests conducted.

6.10.3.2 Inspection and test records must include the identification and calibration status of all measurement tools and test equipment used.

6.10.3.3 Inspection and Test records must be included in the Vehicle History Books, reference Section 7.7.

6.10.4 Outbound Inspection

6.10.4.1 The Authority will perform an outbound inspection to document any missing or damaged items prior to the vehicle leaving Authority property that are not cover within this specification.

6.10.4.2 The inspection report will be provided by the Authority to the Contractor for each truck and bolster at time of shipment. A copy of the document will accompany the truck and the original will be retained by the Authority.

6.10.4.3 The report will include a description of the items included in the shipment and, where available, the identifying serial number(s).

6.10.4.4 The report will note any damage found during outbound inspection that requires repairs beyond the scope of this Specification. Such items will be considered Hidden Damage and must be repaired in accordance with Section 6.12.

6.10.5 Receiving Inspection

6.10.5.1 The Contractor shall conduct a comprehensive receiving inspection of the immediately upon arrival at its facility. This inspection must be conducted, and a report must be generated by the Contractor for each shipment at the time of delivery, prior to commencing repair. The report must be submitted to the Authority within five (5) business days of receipt of the vehicle at the Contractor's facility.

6.10.5.2 The receiving inspection report must include comprehensive digital photographs of the vehicle in the as-received condition. Any

discrepancies between the outbound inspection report and the receiving inspection must be noted.

6.10.5.3 The receiving inspection report must note any damage found during inspection that requires repairs beyond the scope of this Specification. Such items will be considered Hidden Damage and must be repaired in accordance with Section 6.12.

6.10.5.4 Each inspection report must be signed and its accuracy verified by the Contractor's designated Quality Assurance representative.

6.10.5.5 The Authority must be notified of the receiving inspection and provided with an opportunity to witness the inspection.

6.10.6 Pre-Shipment Inspection

6.10.6.1 Prior to leaving the Contractor’s facility, the repaired vehicle must be properly prepared for shipping to ensure that no damage occurs during shipment.

6.10.6.1.1 Any unit not properly covered and protected from damage will not be accepted by the Authority and will be returned to the Contractor for repair at no additional cost to the Authority.

6.10.6.2 A pre-shipment inspection must be performed by the Contractor prior to shipping to confirm that all work has been completed, all components are included in the shipment, and all units have been appropriately prepared for shipping.

6.10.6.2.1 The Authority must be notified of the pre-shipment inspection and provided with an opportunity to witness the inspection.

6.10.6.3 A copy of the report must accompany the shipment and the original must be retained by the Contractor.

6.10.6.3.1 The report must include a description of the items included in the shipment and, where available, the identifying serial number(s).

6.11 Handling and Shipment

6.11.1 The Contractor shall establish and provide a method for shipping and handling of the vehicle to and from the Authority’s’ facility. [CDRL 6.11.1]

6.11.1.1 This plan shall identify methods for preventing damage of the vehicle.

6.11.1.2 Ensure secure storage with an included documented receipt and dispatch.

6.11.1.3 Control Packaging, packing and marking processes.

6.11.1.4 Preserve product quality following final inspection and testing until delivered.

6.12 Nonconforming Material Report (NCR) and Corrective Action Plan (CAP)

6.12.1 Whenever repairs or replacements are required due to nonconforming materials identified by the Contractor, a nonconforming material report (NCR) must be prepared. The NCR shall reference the inspection record in which the nonconformance was identified and list the corrective and preventive actions taken as a result of the nonconformance.

6.12.1.1 Corrective actions must be taken for all nonconforming materials identified by the Contractor.

6.12.1.2 Preventive actions must be taken for all nonconforming materials resulting from the Contractor's or any Subcontractors' work procedures or processes.

6.12.1.3 Multiple repairs or replacements performed on the same assembly may be grouped onto a single NCR in order to reduce the quantity of paperwork generated for each truck.

6.12.2 The Contractor shall develop a Corrective Action Plan (CAP) for all repairs that are beyond the scope of work defined in Section 3.2 (i.e. Hidden Damage repairs).

6.12.2.1 CAPs must include design details, work procedures, labor hours, material costs, and all other information required to repair the nonconformance.

6.12.2.2 CAPs must be submitted for Authority review and approval along with the applicable NCR. Repairs may not be performed prior to approval of the CAP.

6.12.2.3 If necessary, the same CAP may be used by multiple NCRs over the course of the project.

6.12.3 Templates for Nonconforming Material Reports must be submitted for Authority review and approval. [CDRL 6.12.3]

6.12.4 Templates for Corrective Action Plans must be submitted for Authority review

and approval. [CDRL 6.12.4]

6.12.5 NCRs and CAPs must be included in the Vehicle History Books required by Section 7.7.

7.0 CONTRACT REQUIREMENTS AND MANAGEMENT

7.1 Truck and Spare Component Submittal Schedule

7.1.1 An initial submittal, including the items listed below, must be provided to the Authority within thirty (30) calendar days of Notice to Proceed (NTP).

7.1.1.1 Project Quality Assurance Plan [CDRL 6.1.4]

7.1.1.2 Material Procurement and Control Plan [CDRL 6.3.2]

7.1.1.3 Correspondence Management Plan [CDRL 7.3.1]

7.1.1.4 Master Program Schedule [CDRL 7.6]

7.1.1.5 Weekly Progress Report Template [CDRL 7.5.1]

7.1.1.6 Inspection and Test Plan [CDRL 6.10.1]

7.1.1.7 NCR Template [CDRL 6.12.3]

7.1.1.8 CAP Template [CDRL 6.12.4]

7.1.1.9 Program Management and Repair Plan [CDRL 7.2.1]

7.1.1.10 Truck History Book Template [CDRL 7.7.1]

7.1.2 Components/assemblies that are expected to have a long lead time must be identified in the first technical submittal.

7.2 Program Management and Repair Plan

7.2.1 The Contractor shall establish an organization to properly manage this Contract. The organization must be highly responsive to the needs of the Authority, as required by the Contract. The Contractor shall develop and submit a Program Management and Repair Plan to the Authority for review and approval. [CDRL 7.2.1]

7.2.2 The Program Management and Repair Plan must be updated and resubmitted at two (2) month intervals. The Program Management and Repair Plan must describe all

work required by this Specification and must include, but not necessarily be limited to:

7.2.2.1 A description of the Contractor's repair methodology.

7.2.2.2 An Organization Chart identifying all key personnel for the Contractor and Subcontractors. The Organizational Chart must define and describe roles and responsibilities, reporting structure, key positions, personnel and their respective duties and responsibilities. Organizational charts must be revised, as required, for all phases of the Contract.

7.2.2.3 The internal methods and communications to be used to control the program schedule, technical performance, program changes, MRB repairs, subcontracts, purchase orders, material procurement, and field service support.

7.2.2.4 A flowchart of all project tasks, indicating task integration.

7.2.2.5 A Compliance Matrix identifying items that require Authority approval or are otherwise deliverable under the terms of this Contract. The Compliance Matrix must list the Contractor’s document that demonstrates compliance with the requirement or deliverable, the status of the document, and a schedule showing when the document will be submitted or resubmitted to the Authority, unless already approved.

7.2.2.6 The Contractor’s approach for developing work instructions, procedures, tooling, and inspection gages used to perform and control work within the scope of this Contract.

7.2.2.7 A list of all anticipated Work Procedures that will be used for performing work within the scope of this Contract. The arrangement and content of the work procedures must be approved by the Authority as part of the Program Management and Repair Plan.

7.2.2.8 A Bill of Materials listing all components/assemblies used to complete all work within the scope of this Contract.

7.2.2.9 The name and scope of work for all Subcontractors that will be used under this Contract. Subcontractors are subject to Authority review and approval.

7.2.3 The Contractor shall submit all Program Work Procedures to the Authority for

review and approval prior to beginning work. [CDRL 7.2.3]

7.3 Correspondence Management Plan

7.3.1 The Contractor shall develop, maintain, utilize, and distribute a Correspondence Management Plan, which must identify stakeholder information needs, distribution methods, and status reporting requirements (such as status meetings, progress reports, project presentations, etc.). The Correspondence Management Plan is subject to Authority review and approval. [CDRL 7.3.1]

7.3.2 The plan must ensure general awareness of the program requirements among the Contractor, its Subcontractors, and the Authority and must include provision to report program milestones against those expectations.

7.4 Progress Review Meetings

7.4.1 Progress Review Meetings must be scheduled and attended by the Contractor and, as required, any Subcontractors on a weekly basis to review progress of the project. Progress meetings must be used to summarize and review the Weekly Progress Reports [CDRL 7.5.1], written correspondence exchanged since the last meeting, and open action items.

7.4.2 Progress Meeting Agendas must address the topics to be discussed during the meeting and must be distributed by the Contractor a minimum of five (5) working days in advance of the scheduled Progress Review Meeting.

7.4.3 The Contractor's authorized technical representative(s) shall also attend Progress Review Meetings as required to discuss technical aspects of the project and to review comments on documents. The Contractor's technical representatives shall be familiar with detailed design issues to facilitate quick resolution through discussion with the Authority's technical representatives. When appropriate, technical meetings shall be conducted as extensions to the progress meetings.

7.5 Weekly Progress Report

7.5.1 The Contractor shall prepare and submit a Weekly Progress Report to the Authority. The progress report must use an Authority approved template and be the focal point for each weekly's Progress Review Meeting. [CDRL 7.5.1]

7.5.2 The report must describe the current overall status of the vehicle, repair status of each component or assembly in repair, the anticipated future repair dates, any inspection, and test reports performed on the vehicle, anticipated repair dates as needed.

7.5.3 The report must analyze causes for reported delays and provide a plan and schedule

for implementing appropriate corrective and preventive actions.

7.6 Master Program Schedule

7.6.1 The Contractor shall develop and maintain a Master Program Schedule (MPS) for the repair project. The program schedule must provide a graphical representation of the project and identify all milestones, activities, durations, dependencies, earliest and latest possible dates for accomplishing each milestone and activity, the shortest and longest permissible time span between each milestone and activity, and major and minor paths which are critical for accomplishment of program objectives. The Master Program Schedule is subject to Authority review and approval. [CDRL 7.6.1]

7.6.2 The MPS must be monitored and controlled by the Contractor's management team responsible for all management functions and be updated and submitted to the Authority at least monthly during the design and production phases of the Contract. To allow for program evaluation, the monthly updated schedule must display the program status and provide a comparison to the original schedule.

7.7 Vehicle History Book

7.7.1 The Contractor shall provide a Vehicle History Book for the repaired vehicle. The Vehicle History Book template must be submitted for Authority review and approval. [CDRL 7.7.1]

7.7.2 Vehicle History Book must be provided to the Authority at the delivery of the vehicle and contain all information required by this Specification, including:

7.7.2.1 Serial Number of Vehicle.

7.7.2.2 Serial Number of Installed Trucks.

7.7.2.3 Certificate of Compliance, signed and dated, certifying that the assembled vehicle meets the requirements of this Specification.

7.7.2.4 Manufacturer, model, revision level, and serial number of all serialized components installed and removed during the repair.

7.7.2.5 Test and Inspection Records, including receiving inspection, pre-shipment inspection, and all other measurements or readings taken during repair.

7.7.2.6 Work Checklists, demonstrating that all required work procedures have been completed.

7.7.2.7 Nonconforming Material Reports, including all attachments.

7.7.2.8 Corrective Action Plans for all work performed outside of the scope of this Specification.

7.7.2.9 Other documents as may be required by the Authority.

7.8 Facility Audit

7.8.1 All work under this Specification must be performed at the Contractor's or Subcontractor's facilities. Facilities used by the Contractor or Subcontractors may be subject to audit and approval by the Authority prior to conducting work under this contract.

7.8.2 The Authority may elect at any time to perform an audit of those aspects of the Contractor's or Subcontractor's facilities or operations that are related to work performed under this Contract. Reasonable notice will be provided by the Authority in advance of an audit.

7.9 In-Plant Representative

7.9.1 The Authority may station its own inspector at the Contractor's facilities during the Contract. The inspector shall be authorized to inspect all work in-process, work completed, and materials furnished for this Contract. The inspector may take measurements, determine quality of work performed, and make periodic assessments of the Contractor's and Subcontractors' work.

7.9.2 The Contractor shall provide at its facility one workstation with lockable file storage.

7.9.3 The Contractor shall also provide access to telephones and high-speed internet access for Authority representative(s) to have direct access to the internet for connection to project websites and email, with sufficient capacity to exchange large project files, pictures, and drawings.

7.9.4 Upon request, the inspector shall have access to, and be provided with, copies of all drawings, diagrams, data, test procedures, quality records, reports and other information used in connection with the Contract. Any requested documents and information must be provided to the inspector immediately upon request. Delays associated with providing requested information are the responsibility of the Contractor.

7.9.5 The Contractor shall extend to the Authority and its representative(s) full cooperation and necessary facilities to permit the convenient inspection of all

materials, work, and equipment supplied. There must be a suitable means and tools to inspect and test all parts and equipment at the Contractor's facility, including final mechanical and electrical tests of all truck systems. The Authority's representatives must be permitted an agreed upon period of time to conduct each inspection.

7.10 Vehicle Acceptance

7.10.1 The Contractor will be notified in writing of any discrepancies identified during review of the Vehicle History Books, inspection of the vehicle repairs, or acceptance testing.

7.10.2 Conditional Acceptance will be provided by the Authority following successful acceptance testing. Following Conditional Acceptance, vehicle repairs will enter service and the warranty period will start, as defined in the Contract Documentation.

7.10.3 Final acceptance will be provided by the Authority at the completion of the warranty period and resolution of all warranty issues or actions, as approved by the Authority. Failures in service prior to final acceptance will be handled in accordance with the warranty requirements defined in the Contract Documentation.

8.0 CONTRACT DELIVERABLES (CDRL)

CDRL	Subject
5.1.1	Visual Inspection Procedure
5.1.2	Magnetic Particle Inspection Procedure
5.1.3	Dye Penetrant Inspection Procedure
5.1.4	Ultrasonic Inspection Procedure
5.1.5	Weld Repair Procedure of Cracks in Fabricated Structures
5.1.6	Weld Repair Procedure of Defects in Castings
5.1.7	Weld Repair Procedure of Mounting Surfaces
5.1.8	Weld Repair Procedure of Clearance Holes
5.1.9	Repair Procedure of Threaded Holes
5.1.10	Weld Repair Procedure of Threaded Holes
5.1.11	Weld Repair Procedure of Secondary Brackets
5.1.12	WPS, PQR, and Welding Consumable Specifications
5.1.13	Straightening Procedure
5.1.14	Local Heat Treatment Procedure
5.1.15	Furnace Heat Treatment Procedure
5.1.16	Corrosion Protection Plan
5.1.17	Grit Blasting Procedure
5.1.18	Cleaning and Stripping Plan
5.1.19	Ground Pad Inspection, Cleaning, and Repair Procedure
5.1.20	Hydraulic System Leak Test Procedure
5.1.21	Pneumatic System Leak Test Procedure
5.1.22	Hydrostatic Test Procedure
5.1.23	Electrical Testing Procedure
6.1.4	Project Quality Assurance Plan (PQAP)
6.3.2	Material Procurement and Control Plan
6.10.1	Inspection and Test Plan
6.10.2	Inspection and Test Procedures
6.12.3	Templates for Nonconforming Material Reports
6.12.4	Templates for Corrective Action Plans
7.2.1	Program Management and Repair Plan
7.2.3	Program Work Procedures
7.3.1	Correspondence Management Plan
7.5.1	Monthly Progress Report Template
7.6.1	Master Program Schedule

7.7.1	Vehicle History Book Template

9.0 APPENDICES

- **A.** Common Work Requirements
- **B.** Materials and Workmanship Requirements
- **C.** Drawings, Procedures, and Manuals
- **D.** MBTA No. 8 Conformed Technical Specification
- **E.** Terms and Definitions

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